

APPARATUS AND METHOD TO DETERMINE DIALING PREFIXES FOR CALL ORIGINATION TO A TELEPHONE NUMBER

BACKGROUND OF THE INVENTION

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I. Field of the Invention

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The present invention relates to transitioning between states in a communications device. More specifically, the invention relates to transitioning between a first state and second state without having to know the dialing prefixes for the caller in the second state.

II. Related Art

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With the growth in communications and mobility of people in today's society, the number of communications devices is growing exponentially. Along with the growth of communications devices, more and more numbers (such as telephone numbers or other address identifiers) are needed for these devices. Some devices are operable in more than one state – that is, having more than one number. In accordance with devices being operable in more than one state, there is the desire to transition between states. However, each party in communication with one another may not know each other's alternate numbers. Also, depending upon location, regional codes may need to be entered to make a connection. A given party may not know the regional codes required for a connection in a second state. What is needed is the ability to transition between states even if a party may not know the alternate number or its regional codes.

SUMMARY OF THE INVENTION

The apparatus and method described and embodying the invention has the ability to transition between states despite a party not knowing the other party's alternate number or its regional code.

In a communication device operable in at least two states, a method of transitioning between a call in a first state and a second state, each state having an associated number, each number having a prefix portion and a suffix portion, the call having at least one called party and a calling party is described. A party requests a change of state, and then sends at least the suffix portion of the number corresponding to the second state to the calling party. The calling party then compares the number corresponding to the first state with the number corresponding to the second state. The calling party then appends the prefix portion of the number corresponding of the first state with the suffix portion of the number corresponding to the second state. A new call is then established using the number corresponding to the second state. The method may further comprise storing the number corresponding to the first state in memory associated with the calling party. Also, the method may first have an established call in the first state prior to requesting a change of state.

An apparatus configured to transition between a first state and a second state during a call, each state having an associated number, each number having a prefix portion and a suffix portion, the call having at least one called party and a calling party, is also described. A receiver is configured to receive a request of a change of state. A comparer is configured to compare the number corresponding to the first state with the number corresponding to the second state. A grouper is coupled to the comparer and configured to append the prefix portion of the number corresponding of the first state with the suffix portion of the number corresponding to the second state. An establisher is configured to establish a new call using the number corresponding to the second state.

It is an aspect of the invention to allow a communication device to determine the dialing prefixes needed for call origination.

It is an aspect of the invention to allow a user to establish a call in an alternate state without having to have knowledge of regional codes associated with the number in the alternate state.

It is another aspect of the invention to allow any user in a call to request the change in transition from a first state to a second state.

BRIEF DESCRIPTION OF THE DRAWINGS

The features, objects, and advantages of the invention will become more apparent from the detailed description set forth below when taken in conjunction with the drawings in which like reference characters identify correspondingly throughout and where in:

FIG. 1 is a diagram illustrating a call transitioning between a first state and a second state;

FIG. 2 is a flowchart illustrating the steps taken by the calling party in transitioning from a first state to a second state;

FIG. 3 is a flowchart illustrating the steps taken by the called party in transitioning between a first state and a second state;

FIG. 4 is a diagram illustrating a group call transitioning between a first state and a second state;

FIG. 5 is a flowchart illustrating the steps taken by the calling party in a group call in transitioning between a first state and a second state; and

FIG. 6 is a flowchart illustrating the steps taken by the called party in a group call in transitioning between a first state and a second state.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

FIG. 1 illustrates a call between two parties and transitioning between a first state and a second state **100**. A calling party **104** has at least two states, a first state **108** and a second state **112**. Similarly, a called party **116** has a first state **120** and a second state **124**. It is contemplated that either party may have any number of states. The logic of the apparatus and method described carries through regardless of the number of states of each party. In an embodiment, an established channel **128** exists between calling party **104** and called party **116**. The established channel **128** may be any type of communication path, such as a voice channel, a data channel, a clear channel, a secure channel, an asynchronous data channel, or any other type of communications channel between communication devices.

Calling party **104** and called party **116** may be using any type of communications device, such as a lined telephone, a wireless telephone, a pager, a personal communication device such as a Palm Pilot TM, or any other communications device on any type of communications channel. Communication channels may be wire-line, PSTN, or wireless standards such as Code Division Multiple Access (CDMA), CDMA2000, Wideband Code Division Multiple Access (WCDMA), Time Division Synchronized Code Division Multiple Access (TD-SCDMA) Global System for Mobile Communications (GSM), Time Division Multiple Access (TDMA) or any like communications systems.

Each state (**104**, **108**, **120**, **124**) has an associated number. For example, the first state **108** of the calling party **104** has an associated telephone number that is different than a telephone number associated with the second state **112**. Similarly, first state **120** of called party **116** has a number that is different than second state **124** of called party **116**. Each number of each party has associated codes, such as regional and area codes, which may be described as prefix portions (regional codes) and suffix portions (actual telephone number). For example, a caller in the United States dialing internationally dials a number of the form "011 - country code - city code - number". Thus, if the calling party **104** is in San Diego, California of the United States, and called party **116** is in London, England, the number of the calling party **104** in San Diego may be 00-1-858-123-4567 and the number of called party **116** in London may be 011-41-171-123-4567. Thus, the prefix portion of the calling party **104** is "00-1" and the suffix portion is "858-123-4567". Similarly, the prefix portion of the called party **116** is "011-41-171" and the suffix portion is "123-4567".

As stated above, this embodiment assumes that an established call exists between first state **108** of calling party **104** and first state **120** of called party **116**. Also assume that the

called party **116** wants to transition to the second state: that is, establish a channel or a new call between second state **112** of calling party **104** and second state **124** of called party **116**. If the calling party **104** is located in the San Diego and the called party **116** is located in London, the calling party **104** has different dialing requirements (regional codes or prefixes) to reach the called party **116** than the called party **116** has to reach the calling party **104**. But, if the called party **116** wishes to transition to the second state, and doesn't know calling party's **104** number associated with the second state **112**, called party **116** has to receive the number associated with second state **112** from calling party **104**. Similarly, the calling party **104** may not know the dialing prefixes necessary when the calling party **104** is calling from abroad. However, since calling party **104** originated the established call in the first state, calling party **104** knows, or has internal or attached memory having, the required dialing prefixes. Thus, regardless of whether the calling party **104** or the called party **116** requests transition to an alternate state, the calling party **104** originates the transition between the first state and the second state.

For example, called party **116** issues a request to transition **132** from the first state (**108** and **120**) to the second state (**112** and **124**). Calling party **104** has a receiver **142** to receive the request. After the request to transition **132**, the called party **116** sends the calling party **104** its number **136** associated with its second state **124**. The number **136**, or suffix portion, does not have the regional codes, or prefix portion, needed to allow calling party **104** to originate a new call to called party **116**. Upon receipt of the request **132** and the associated number **136** by the receiver **142**, calling party **104** uses an internal comparer **144** to make a comparison of the prefix portion and number (suffix portion) associated with the first state **120** with the number (suffix portion) associated with the second state **124**. Again, since the calling party **104** initiated the initial established call between the first state **108** and **120**, a knows, or has access to, the dialing prefixes necessary for transition into the second state, or originate a new call using the number of the second state. Calling party **104** then uses a grouper **148** to attach or associate the prefix portion associated with the number from the first state **120** to the suffix portion associated with the second state **124**. Alternatively, the grouper **148** may strip the number, or suffix, of the first state and attach the number, or suffix, of the second state. Accordingly, calling party **104** has constructed the full numerical sequence; that is, the prefix portion and the suffix portion, necessary to establish a call in the second state **140**. An establisher **152** then establishes the connection in the second state **140**.

FIG. 2 illustrates the process undergone by the calling party **104** in such a transition as described with the respect to FIG. 1. An established channel or call **204** is assumed. The

calling party **104** receives a request **208** from called party **116** to transition to a second state. Calling party **104** uses its receiver to receive the request **208** and to receive the called party's number **212** associated with its second state **124**. The calling party **104** then, using the comparer, internally compares **216** the number associated with the first state **120** with the number associated with the second state **124**. Using the grouper, calling party **104** is then able to strip **220** the number associated with first state **120**, or attach the prefixes **220** from the number associated with first state **120** to the number associated with second state **124**. Calling party **104** then uses its establisher to establish **224** a new call or communication channel between the second states **112** and **124**.

In an embodiment, the transitioning described above may be used in wireless telephones, for example, in wireless data capable devices that utilize specific over the air service options for specific call types. For example, calls in one state, say voice calls, may utilize over-the-air service options designated for voice, while calls in a second state, say asynchronous data calls, utilize over-the-air service options designated for asynchronous data. Each wireless telephone has associated with it a telephone number, and each phone number is provisioned for certain specific service options. For example, a phone number may be provisioned for voice service service-options, for voice service service-options and for data service service-options. Multiple parties engaged in a voice call originated between at least two such phones may desire to transition to a data call, or vice versa. In other words, the two parties engaged in a call may want to transition between clear and secure modes.

FIG. 3 illustrates a diagram of the steps undertaken by called party **116** in transitioning between a first state and a second state. Again, it is assumed that a channel is established **304** between calling party **104** and called party **116**. Called party **116** then sends a request **308** to calling party **104** to transition from the first state to the second state. The called party **116** then sends its number associated with the second state **312**. After calling party **104** makes comparisons between the numbers provided by called party **116** and attaches the proper prefixes, called party **116** receives a "go to second state" request **316**, thereby establishing a call in the second state.

FIG. 4 illustrates transitioning between states in a situation where there are multiple called parties **400**, such as in a group communication environment. Operation of group communications systems is explained in more detail in pending U.S. patent application "Method And Apparatus For Enabling Group Communication Services In An Existing Communication System", Serial No. 09/518,622, filed on March 3, 2000, "Method And Apparatus For Participating In Group Communication Services In An Existing

Communication System”, Serial No. 09/518,776, filed on March 3, 2000, and “System And Method For Providing Group Communication Services In An Existing Communication System”, Serial No. 09/518,985, filed on March 3, 2000.

In a group communication environment, a calling party **404** has an established group call **452** between called parties **408**, **412**, and **416**. Called party **404** and each calling party **408**, **412**, and **416** each have first and second states. Calling party **404** has a first state **420** and a second state **424**. Called party **408** has a first state **428** and a second state is **432**. Called party **412** has a first state **436** and a second state **440**. Called party **416** has a first state **444**, and a second state **448**.

Assume that called party **416** requests a transition **456** between each party's first state to each party's second state. The request **456** goes to calling party **404**. Upon calling party **404** acknowledging the request to transition, the calling party **404** send a request to transition **460** to the members of the group call **408**, **412** and **416**. On receipt of the request by each of the called parties **408**, **412**, and **416**, each called party sends **464** its number associated with its second state. Calling party **404** makes comparisons between the numbers associated with each state of each called party **408**, **412**, and **416** to determine the prefix portion as separated from the suffix portion. Calling party **404** then establishes a new connection **468** to each of the called parties **408**, **412**, and **416**.

In an alternate embodiment, a communications manager **472** acts as an intermediary between calling party **404** and each of called parties **408**, **412**, and **416**. Requests for change of state are processed through communications manager **472**, and otherwise processes substantially the same as described above. Communications manager **472** may contain memory having the numbers and regional codes for all of the group members. Accordingly, wherever possible, sending of numbers of alternate states may be accomplished through communications manager **472**, and not from each called party **408**, **412** and **416**.

FIG. 5 illustrates a flowchart **500** of transitioning between states in a group call as described with the respect of FIG. 4. Assume that an established channel exists **504** between the participants of the group call. Calling party **404** receives a request to transition from one state to another **508** from one of the called parties. Calling party **404** then sends a request to each of the calling called parties **408**, **412**, and **416** for its number associated with the second state **512**. Calling party **404** then receives each number **516** from each of the called parties **408**, **412**, and **416**. In the alternate embodiment, calling party relies on communications manager **472** to acquire the alternate number, or already have the alternate number in memory. The calling party **404** then compares **520** each number associated with the first

state with each number associated with the second state for each of the called parties **408**, **412**, and **416**. In the alternate embodiment, the communications manager may make this comparison. Calling party **404** attaches **524** prefixes from the first state of each of the called parties **408**, **412**, **416** to the second state of each of the called parties **408**, **412**, and **416**. The calling party **404** then establishes a new call **528** to each of the called parties **408**, **412**, and **416**.

FIG. 6 illustrates the steps undergone by each of the called parties in a group call transitioning between a first state and a second state. It is assumed that an established channel exists **604**. For any called party that did not request to transition between states, the first notification to transition is received from the calling party **404**. This is illustrated as step **608** in FIG. 6. The called party then sends its number **612** associated with the second state. After the calling party **404** receives the numbers associated with each second state and attaches the prefixes previously known from the number associated with the first state, each called party receives a request to establish a new channel **616**.

The previous description of the embodiments as provided to enable any person skilled in the art to make or use the invention. The various modifications to these embodiments will be readily apparent to those skilled in the art, and the generic principals to find here and may be applied to other embodiments with out the use of the inventive faculty. Thus, the invention is intended to be limited to the embodiments shown herein but is to be accorded the widest scope consistent with the principals and novel features disclosed herein.

What we claim as our invention is: